



Opening words

Dear EBEAM Friends,

Welcome to the forefront of scientific innovation and discovery! As part of the EBEAM project, funded by the prestigious Horizon Europe ERA Chairs program, we are thrilled to share our vision of revolutionizing material fabrication at the nanometer scale, progressing toward the precision of atom-by-atom assembly. Our mission is to harness the extraordinary potential of electron beam technology to redefine the synthesis and engineering of materials. By achieving precision at the atomic level, we aim to pioneer applications that enable the creation of materials with unparalleled properties, unlocking groundbreaking applications in energy, healthcare, and advanced electronics. These efforts promise to transform not just the scientific landscape but also the technological and societal frameworks of our time. At the helm of this ambitious initiative is our ERA Chair holder, Prof. Dr. Mark H. Rummeli, a globally renowned expert in nanotechnology and electron beam sciences. With his exceptional expertise and leadership, Prof. Rummeli is guiding our team in exploring uncharted territories in nanomaterials research and precision manufacturing. His vision and dedication inspire us to push the limits of what is possible, nurturing a collaborative and innovative environment for all involved. As we embark on this journey toward atom-precise fabrication, we invite you to join us in celebrating and contributing to the advancements that will shape the future. Together, we aim to transform challenges into opportunities, advancing knowledge and creating impactful solutions for generations to come.

Warm regards,
The EBEAM Team

Our goals

The overarching project objective is to introduce innovative approaches for precise materials fabrication at the nanometer scale, ultimately toward atom precision, including additive manufacturing, using electron beams. This will help revolutionize material synthesis, and fabricate novel atom-level devices fabrication, and lead to the development of novel devices. It will, resulting in the discovery of materials with unique functionality and groundbreaking micro- and nano- processing engineering, advancing fields such as technology, energy, and healthcare.

Meet our ERA Chair holder



Prof. Dr. Mark H. Rummeli is a renowned researcher at the forefront of nanotechnology, specializing in nano-materials, nano-bio studies, and their applications in energy storage, such as lithium-ion batteries, and electron beam materials science. Since January 2024, he has been leading the esteemed EBEAM (Electron Beam Emergent Additive Manufacturing) project under the Horizon Europe ERA Chairs program at the Institute of Environmental Technologies (CEET), VSB-TUO. He is also a key contributor to the REFRESH project, supported by the Just Transition Fund.

Prof. Rummeli's pioneering work explores the mechanisms underpinning the formation and functionalization of low-dimensional materials, driving innovations in bespoke custom material design. His research aims to unlock the full potential of nanomaterials for renewable energy solutions and biomedical advancements.

With over 400 peer-reviewed publications, 75+ invited talks, and a remarkable citation count exceeding 20,000, Prof. Rummeli's contributions continue to shape the global landscape of advanced materials and nanotechnology research. As the ERA Chair, he is committed to fostering scientific excellence, nurturing young researchers, and establishing the EBEAM Centre as a hub of innovation and collaboration.

[Learn more](#)

Interview

We have a good chance of making a groundbreaking discovery



Ondřej Sakreida, a first-year PhD student at the Faculty of Materials and Technology at VSB-TUO, joined the EBEAM team in November 2024. Despite needing to balance his research for the project with his studies, he was pleased to accept the offer to collaborate with ERA Chair project holder Mark Rummeli. The technology at the heart of the EBEAM project could, in his view, fundamentally change society. In this interview, Ondřej shares his expectations and tasks within the project.

How did you start collaborating with Professor Marek Rummeli on his EBEAM project?

The open position was recommended to me by the Director of the Centre for Nanotechnology, Gražyna Simha Martynková. Later on, Professor Rummeli and I met, and he offered me the position.

What attracted you to this opportunity?

The technology at the heart of the EBEAM project could, in my view, fundamentally change the society. As a nanotechnologist, I've seen a lot of methods for controlled material and nanomaterial preparation, so I know it's a complex process, and many methods turn out to be unsustainable, energy-intensive, and create numerous by-products. In contrast, methods like EBEAM allow us to use electron beams for highly precise preparation with extreme accuracy. This is an unprecedented technology that could open up a wide range of applications in energy, electronics, the semiconductor industry, and beyond.

So, the biggest appeal for you was the chance to work on something completely new?

That's incredibly attractive to me as a young researcher. I believe there's a real chance we could make a breakthrough in a specific field or in preparation methods. At the same time, I'm thrilled to work in an international team under the guidance of a world-renowned researcher. It's almost unbelievable how much I've learned just in the first few weeks of this collaboration. Another big advantage is the opportunity to work with state-of-the-art microscopes, which we'll even have the chance to modify ourselves. That's a unique opportunity you don't get everywhere. All this is very appealing.

[Learn more](#)

News

We present the project to the professional community ...



Professor Rummeli Delivers Key Lecture at Nanocon Conference

Researchers from VSB-TUO had a strong presence at the 16th annual Nanocon conference, held in Brno from October 15 to 17, 2024. Among the invited speakers was Mark Rummeli, the holder of the prestigious ERA Chairs EBEAM grant.

The Nanocon International Conference, organized by TANGER and the Czech Society for New Materials and Technologies, is the first conference in the Czech Republic dedicated to nanomaterials, showcasing research, applications, and their potential environmental impact. "It was an excellent opportunity to share insights and engage with a vibrant community of researchers dedicated to advancing nanotechnology," commented Professor Rummeli on the conference participation.

The conference attracted over 200 participants, featuring 81 lectures and 108 posters during the poster session. Professor Rummeli delivered a talk titled "Towards Atom Precise Synthesis and Engineering with Electron Microscopes" during the session on Advanced Methods for Preparation and Characterisation of Nanosystems.

[Learn more](#)

Professor Rummeli Spoke at PRIME 2024 Conference

Professor Mark H. Rummeli, delivered an invited lecture at the ninth PRIME meeting, one of the world's most prestigious conferences on electrochemistry and solid-state science. The event took place from October 6th to 11th in Honolulu, Hawaii, and was organized by The Electrochemical Society (ECS), The Electrochemical Society of Japan (ECSJ), and The Korean Electrochemical Society (KECS).



"A key feature of my research was to develop a transmission electron microscope (TEM) into an atomic-scale laboratory. This innovative approach allowed for the fabrication, modification, and characterization of samples, enabling crucial structure-property studies and synthesis studies to be conducted with high spatial and temporal resolution. Central to my presentation was an exploration of various electron beam-driven chemical reactions and electron beam engineering techniques, through which we could fabricate and manipulate nano-materials at the atomic level. Such approaches were important for the development and refinement of advanced materials and technologies, for example, the efficiency and performance of electronic and photonic devices," explained Professor Rummeli.

[Learn more](#)



EBEAM Project Joined Prestigious DSL2024 Conference in Barcelona

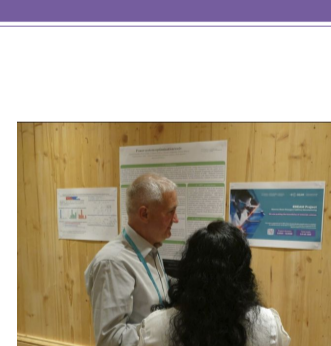
The EBEAM project joined the 20th International Conference on Diffusion in Solids and Liquids (DSL2024) held in Barcelona, Spain, from 24-28 June 2024.

Professor Mark H. Rummeli, ERA Chair holder of the EBEAM project, was involved in preparing one of the program components of the conference, which combined two dynamic events: the Special Session 'Microscopy, Microanalysis, and their Application on Materials' (SS11) and the 'ERA Chair E-BEAM Symposium on Advanced Materials Synthesis via Precision Manufacturing'. The DSL conference prides itself on being renowned as a leading forum for the discussion of currently pressing issues in diffusion and its various applications. Every year, a balanced portion of delegates from academia and industry attend the event, thus forming a binding platform for researchers and industry leaders to network, exchange ideas, and contribute to overcoming challenges in the field.

[Learn more](#)

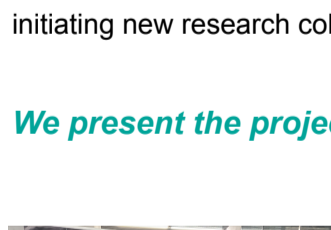
EBEAM & HPCSE 2024

Our colleague Pavel Praks presented the EBEAM project at the High Performance Computing in Science and Engineering 2024 conference (HPCSE 2024) in May. His presentation was well-received.



The HPCSE 2024 conference, organized by IT4Innovations, VSB-TUO, has a long-standing history. It aims to bring together international specialists in high performance computing, applied mathematics, numerical analysis, high performance data analytics, machine/deep learning, quantum computing, and advanced visualization. The conference provides a platform for exchanging experiences and ideas, and initiating new research collaborations.

We present the project to the general public ...



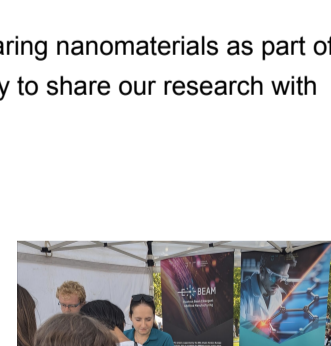
EBEAM Project at Researchers' Night 2024

Members of our team, Szymon Abrahamczyk and Ondřej Sakreida, took part in this year's Researchers' Night at VSB-TUO. The event attracted thousands of visitors, offering them a chance to explore what can be seen under an electron microscope.

"We wanted to showcase the slightly unconventional use of the microscope for preparing nanomaterials as part of the EBEAM project," explained Szymon Abrahamczyk. It was an amazing opportunity to share our research with the public and introduce the fascinating world of nanotechnology!

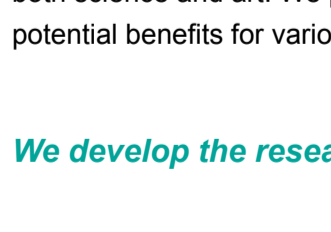
EBEAM joined the annual Art & Science Festival

Since 2015, VSB-TUO has been bringing science and art together at the annual Art & Science Festival! This year, the festival took place on Thursday, September 5. We proudly presented our EBEAM project.



The program focuses on both science and art. The organizers dedicate the morning to primary and secondary schools, and the afternoon to students, employees, and graduates. The program focuses on both science and art. We presented the main objectives of the project to the interested parties and its potential benefits for various applications.

We develop the research environment ...



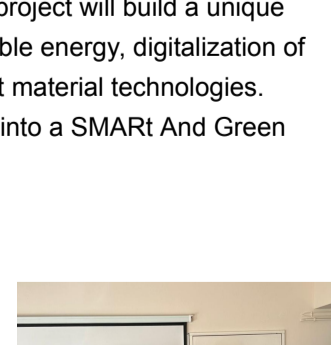
The EBEAM and REFRESH projects are in close contact

Professor Mark H. Rummeli presented his research at the Energy Lab Seminar. Energy Lab is part of the REFRESH project supported by the Just Transition Fund.

The REFRESH project is the "flagship" and a key tool in achieving SMARAGD's vision. It represents a major investment to strengthen research excellence in the Moravian-Silesian Region. The project will build a unique European infrastructure for research and technology transfer in the fields of sustainable energy, digitalization of industrial production, automation in transport, environmental technologies, and smart material technologies. Linking academic and industrial partners will lead to the transformation of the region into a SMART And Green District in the spirit of the SMARAGD vision.

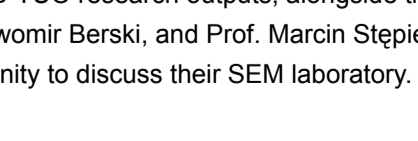
Scientific Collaboration with Polish Partners

As science thrives on international cooperation, showcasing research from VSB-TUO as well as the ERA Chair EBEAM project on the global stage is a key mission of the EBEAM project.



To discuss future collaboration projects, ERA Chair Holder Prof. Dr. Mark Rummeli visited his colleagues in Wrocław, Poland, in February. During his time at Łukasiewicz - PORT, where he chaired the Institute Council, ERA Chair Holder Prof. Dr. Mark Rummeli met with the director, Alicja Bachmatuk, and the director of the Centre for Materials Science and Engineering, Joanna Cybińska to share VSB-TUO research outputs, alongside those of the EBEAM project. He also met with the Dean of Chemistry, Prof. Sławomir Berski, and Prof. Marcin Stępień at Uniwersytet Wrocławski. During the visit, they also had the opportunity to discuss their SEM laboratory.

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